

AIR SERVICE INFORMATION CIRCULAR

(AVIATION)

PUBLISHED BY THE CHIEF OF AIR SERVICE, WASHINGTON, D. C.

Vol. IV

August 15, 1922

No. 362

STATIC TEST OF THOMAS-MORSE MB-6 AIRPLANE

(AIRPLANE SECTION, S. & A. BRANCH)



Prepared by E. R. Weaver
Engineering Division, Air Service
McCook Field, Dayton, Ohio
May 2, 1922



WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

CERTIFICATE.

By direction of the Secretary of War the matter contained herein is published as administrative information and is required for the proper transaction of the public business.

(11)

STATIC TEST OF THOMAS-MORSE MB-6 AIRPLAN

SUMMARY OF RESULTS.

Airplane: Thomas-Morse MB-6.
Type: Biplane.
Total weight: 2,023 pounds.
Wing cellule, weight: 216 pounds.
Wing area: 150.34 square feet.

Engine: 400 horsepower, Wright.
Description: This airplane is a single seater racer, mounting a 400 horsepower high compression 8-cylinder Wright engine. The wings and fuselage are of wood construction and covered with fabric.

Results of tests.

Date.	Part tested.	Load required.	Pounds per square foot of factor supported.	Failed at—	Weight.	Failure.
1921. Oct. 14	Horizontal stabilizer.	35 pounds per square foot.	35 pounds per square foot.		1.52 pounds per square foot.	Structurally satisfactory.
14	Elevator.	do.	do.		1.12 pounds per square foot.	Do.
14	Elevator control.	7.	7.			Cross member supporting the control stick showed a torsional deflection of one-half inch.
Oct. 15	Vertical fin.	30 pounds per square foot.	40 pounds per square foot.		0.93 pounds per square foot.	Structurally satisfactory.
15	Rudder.	do.	do.		1.21 pounds per square foot.	Do.
15	Rudder control.	6.	8.			Do.
Oct. 25	Ailerons.	35 pounds per square foot.	37.5 pounds per square foot.		1.28 pounds per square foot.	Do.
25	Aileron control.	7.	7.5.			Do.
Oct. 20	Wing cellule: High incidence	8.5.	8.5.	9.	1.43 pounds per square foot.	Do.
Oct. 18	Low incidence	5.5.	5.5.		do.	Do.
Oct. 24	Six foot length of leading edge.	14.	20.	20.8.		Do.
Oct. 27	Fuselage.	7.	10.5.	11.	140.5 pounds.	Do.
Oct. 29	Tail skid.	36-inch drop.		12-inch drop.		Structurally unsatisfactory.
Nov. 1	Chassis: Struts.	6.	7.	8.		
	Axle.	5.5.	7.			
	Shock absorber.	5.	7.			Structurally satisfactory.

DISCUSSION.

To the wing area should be added the area of the landing chassis aerofoil which is 5.11 square feet; this makes the total effective aerofoil 155.45 square feet. From the total area of the upper wing the area of the two built-in radiators (4.31 square feet) has been deducted. The cross member supporting the control stick is the only part of the control system that showed any weakness, this member should be heavier. The tail skid is weak and the tail skid shock absorber should be redesigned.

OBJECT.

This static test was conducted for the purpose of determining the structural strength of the Thomas-Morse MB-6 airplane submitted in accordance with Contract No. 370. This airplane bore the A. S. No. 68538.

DATE AND PLACE.

The following tests were performed at McCook Field, Dayton, Ohio, on dates as follows:

1. Oct. 14, 1921..... Elevator and stabilizer.
2. Oct. 15, 1921..... Rudder and fin.

3. Oct. 25, 1921..... Ailerons.
4. Oct. 18, 1921..... Wing cellule (low incidence).
5. Oct. 20, 1921..... Wing cellule (high incidence).
6. Oct. 27, 1921..... Fuselage.
7. Oct. 29, 1921..... Tail skid.
8. Nov. 1, 1921..... Landing chassis.
9. Oct. 24, 1921..... Leading edge.

WITNESSES.

- Lieut. C. N. Monteith... Tests Nos. 1, 2, 4, 5, 7.
Lieut. E. W. Dichman... Tests Nos. 1, 2, 3, 4, 5, 6, 8.
Lieut. J. A. Macready.... Tests Nos. 4, 5, 6.
Lieut. S. P. Mills..... Tests Nos. 4, 5, 6.
B. C. Boulton..... Test No. 7.
W. E. Savage..... Tests No. 1, 2, 3, 4, 5, 6, 7, 8, 9.
D. B. Weaver..... Tests No. 1, 2, 3, 4, 5, 6, 7, 8, 9.

GENERAL DESCRIPTION.

The Thomas-Morse MB-6 airplane is a single-seater, racing-type biplane of wood construction. The airplane mounts a high-compression 8-cylinder Wright 400-horsepower engine.

The desired performance is as follows:

- (a) High speed, 175 miles per hour.
 - (b) Climb, not important.
 - (c) Ceiling, not important.
 - (d) Landing speed, not in excess of 75 miles per hour.
- Total weight, 2,023 pounds.

Wing area, 155.45 sq. feet including area of landing chassis airfoil.

Weight per square foot, 13.01 pounds.

Weight per horsepower, 5.057 pounds.

Airfoil, R. A. F.-15.

The list of equipment may be found in Section IV of contract No. 370.

Figure 1 is a plan view of the MB-6 airplane.

Figure 2 is a front and side view of the MB-6 airplane.

WING CELLULE.

DESCRIPTION.

The wing construction is entirely of wood. The spars are laminated spruce built up of plies one-eighth inch in thickness. The ribs are plywood with spruce cap strips. The upper wing panel has spars that extend the length of the wing, while the spars of the lower panels are short, being joined by fittings to the lower longerons. The leading edge strip is spruce and the trailing edge is made by connecting the ribs with a wire.

Figure 3 is a drawing of the upper wing structure.

Figure 4 is a drawing of the lower wing structure.

Figure 5 shows typical spar sections.

PROCEDURE FOR TEST (LOW INCIDENCE).

The wings were assembled on the airplane as for flight and the airplane inverted and loaded in accordance with the loading schedule in Figure 6.

The angle of inclination of the wing chord to the horizontal (angle γ) was $5^\circ 52'$ trailing edge down. This was determined from the high-speed angle of incidence α and the angle β between the lift and the resultant air force.

$$\alpha = 0^\circ 48'$$

$$\beta = \cot^{-1} 8.55 = 6^\circ 40'$$

$$\gamma = \alpha - \beta = 6^\circ 40' - (48') = 5^\circ 52'$$

The center of gravity of the load was located at 40 per cent of the wing chord from the leading edge.

The wings were required to support a load factor of 5.5.

RESULTS.

The wings supported a load factor of 5.5 without signs of failure.

The deflections are tabulated in Figure 7.

Figure 8 shows the spar deflection curves.

CONCLUSION.

The wings supported the required load in a satisfactory manner.

PROCEDURE FOR TEST (HIGH INCIDENCE).

The airplane was reset for the high incidence test, with the wing chord at an angle of $-5^\circ 39'$ to the horizontal with leading edge down. The wings were loaded in accordance with the loading schedule in Figure 9. The angle of inclination (γ) was determined from the angle of

maximum lift α and β , the angle between the lift and the resultant air force.

$$\alpha = 14^\circ 48'$$

$$\beta = \cot^{-1} 6.2 = 9^\circ 9'$$

$$\gamma = \beta - \alpha = 9^\circ 9' - (14^\circ 48') = -5^\circ 39'$$

RESULTS.

The required load factor for the high-incidence test was 8.5. The wings supported this load satisfactorily. At a load factor of 9 the left rear strut failed in compression when the strut fitting bolt sheared.

Figure 10 gives the spar deflections in inches.

Figure 11 shows the spar deflection curves.

Figure 25 is a photograph of the strut failure.

Figure 26 is a photograph of the strut fitting.

TABLE I.—Strength properties of laminated spruce wing beams from the Thomas-Morse MB-6 airplane.

Airplane member.	Moisture content (per cent).	Specific gravity.	Modulus.				Loading and span.
			Rupture (pounds per square inch).	Elasticity (1,000 pounds per square inch).	Fiber stress at elastic limit (pounds per square inch).	Compression parallel to grain (pounds per square inch).	
Lower left:							
Rear....	8.85	0.501	9,370	2,120	6,290	8,460	Third point, 60 in.
Front....	9.24	.515	9,890	2,010	6,180	7,520	Do.
Upper:							
Rear....	8.52	.454	8,500	1,802	5,810	7,500	Do.
Front....	8.57	.457	8,560	1,892	5,560	7,260	Do.

DISCUSSION.

Examination of the strut failure revealed diagonal grain.

The strength properties of the four wing beams were uniform and were about the same as those of average grade of spruce, although the specific gravity ran about 20 per cent higher. The large amount of glue area increases the specific gravity of the wing beams without any corresponding increase in strength.

CONCLUSION.

The wings are structurally satisfactory.

AILERON TEST.

DESCRIPTION.

The MB-6 aileron is unbalanced and of wood construction. The structure is built on a wide box spar having main members of spruce joined with plywood. Between each rib large holes are cut in the plywood in order to lighten the structure.

The ribs have plywood cores and spruce cap strips. The trailing edge is formed by a wire connecting the rib ends.

Weight of aileron..... 9 pounds.

Area of aileron..... 7 square feet.

Weight per square foot..... 1.285 pounds.

Figure 12 is a drawing of the aileron structure.

PROCEDURE.

The aileron was assembled on the wing and the controls connected. A spring balance was coupled to the control stick to measure the pull on the stick. The aileron was then loaded according to the loading schedule in Figure 12.

RESULTS.

The aileron supported an average load of 37.5 pounds per square foot without failure.

CONCLUSION.

The aileron structure and controls are structurally satisfactory, the required load per square foot being 35 pounds.

ELEVATOR AND STABILIZER.

DESCRIPTION.

The elevator and stabilizer are of wood construction. The forward spars of these surfaces are wide box spars with spruce main members joined by plywood. On both the elevator and stabilizer large holes are cut through the plywood between the ribs in order to lighten the structure.

The rear spar of the stabilizer is a spruce member covered with plywood on the top and bottom which helps to tie the rib caps in solidly. To this member are bolted the hinges of the elevator.

The fin is a part of the stabilizer structure.

Figure 13 is a drawing of the stabilizer and elevator structure.

Figure 14 shows typical rib sections and spar sections.

The following is a table of weights and areas of elevator and stabilizer:

	Weight.	Area.	Weight per square foot.
	<i>Pounds.</i>	<i>Square feet.</i>	<i>Pounds.</i>
Elevator.....	15.75	14.00	1.125
Stabilizer.....	10.00	6.54	1.52

The elevator is of the balanced type with cable control.

The stabilizer is mounted on the fuselage and has no adjustment for varying the angle of incidence.

PROCEDURE.

The stabilizer and elevator were mounted on the fuselage as for flight and a spring balance attached to the control stick to register the pull in the cables. The surfaces were then loaded according to the loading schedule in Figure 15.

The center of gravity of the load on the elevator was located at five-twelfths of the chord from the hinge center line, due to the fact that the load at the trailing edge was one-third the load at the hinge center.

RESULTS.

Figure 15 shows the deflections and results of the test. The horizontal tail surface stood the test without signs of failure.

DISCUSSION.

The required load per square foot for the stabilizer and elevator is 35 pounds. At this load the cross member sup-

porting the control stick showed a torsional deflection of one-half inch. It is evident that this member should be heavier.

CONCLUSION.

The horizontal tail surfaces are structurally satisfactory.

RECOMMENDATIONS.

Redesign the cross member supporting the front part of the pilot's seat and the control stick so as to eliminate excessive deflection when tail surfaces are supporting their required load.

RUDDER AND FIN.

DESCRIPTION.

The rudder and fin are of wood construction similar to the horizontal tail surfaces.

The rudder structure has one main box spar whose main members are spruce connected with plywood. To this spar the ribs are attached. The ribs are plywood with spruce cap strips. Midway between the main box spar and the trailing edge is a light spruce spar which adds stiffness to the structure. The trailing edge is a steel wire fastened to the ribs by metal strips nailed to the ribs. The upper and lower end pieces are curved laminated spruce. The rudder is of the balanced type.

The fin, which is built on the stabilizer, consists of a laminated spruce curved top member stiffened by plywood on each side.

Figure 16 is a drawing of the rudder and fin structure.

Figure 17 shows typical sections.

The following is a table of weights and areas of rudder and fin:

	Weight.	Area.	Weight per square foot.
	<i>Pounds.</i>	<i>Square feet.</i>	<i>Pounds.</i>
Rudder.....	7.00	5.79	1.21
Fin.....	1.75	1.88	.93

The rudder is controlled by cable.

PROCEDURE.

The rudder and fin were mounted on the fuselage. The fuselage was turned on its side and the surfaces were then loaded according to the load schedule in Figure 18. A spring balance was coupled in the controls to register the pull in the wires.

The center of gravity of the load on the rudder was located at five-twelfths of the mean chord from the hinge center, due to the fact that the load at the trailing edge was one-third the load at the hinge.

RESULTS.

The required loading for the rudder and fin was 30 pounds per square foot. The surfaces supported an average loading of 40 pounds per square foot without signs of failure.

CONCLUSION.

The rudder and fin are structurally satisfactory.

FUSELAGE.

DESCRIPTION.

The fuselage of the MB-6 is of wood construction with swaged steel brace wires. The fittings are formed sheet steel and of the wrapped type. The upper longerons are laminated white ash as far back as the rear of station 5; from this point rearward the longerons are spruce.

The lower longerons are laminated white ash as far back as the rear of station 3; from this point rearward the longerons are spruce. All the vertical brace members are spruce and are routed T section in shape. The engine bearers are laminated ash and are carried on plywood bulkheads.

Figure 19 is a drawing of the fuselage structure.

PROCEDURE.

The fuselage was supported on a jig in such a manner as to transmit the entire load to the jig through the wing fittings. The structure was loaded as indicated by the loading schedule in Figure 20.

Deflection readings were taken at points along the structure as indicated in Figure 21.

RESULTS

The fuselage structure was required to support a load factor of 7. The engine bearers supported a load factor of 7.5 without any signs of failure. With load factor of 11 on the tail the wires in the fourth bay to the rear of the pilot's cockpit failed.

Figure 21 shows the results of the fuselage test.

Figure 27 is a photograph of the failure.

DISCUSSION.

The longerons showed much distortion and small cracks, developed in them. After the load was removed the longerons showed a permanent set.

CONCLUSION.

The fuselage structure is structurally satisfactory.

LANDING CHASSIS.

DESCRIPTION.

The landing chassis of the MB-6 is of the V strut type, with streamline brace wires and a tubular steel axle. The axle consists of two short tubes hinged at the inner ends and supported at the hinges by vertical streamline tension wires which take the load. The axle assembly is contained in an airfoil which serves as a stiffening member between the struts.

Figure 22 is a drawing of the landing chassis.

PROCEDURE.

The landing chassis was mounted in the test jig in such a manner that the center of gravity of the load was vertically over the center of the axle. The landing chassis

was loaded in accordance with the loading schedule in Figure 23. No axle deflections were measured. The only deflection measured was that of the shock absorbers.

RESULTS.

The required load factor for the landing chassis was 6. The chassis supported this load without signs of failure. At a load factor of 8 the right front strut failed.

Figure 23 shows the test results.

Figure 28 is a photograph of the failure.

CONCLUSION.

The landing chassis is structurally satisfactory.

LEADING EDGE TEST.

DESCRIPTION.

A 6-foot section of the upper wing panel was supported along the spar centers on a timber framework. The wing section was loaded from the center line of front spar to the leading edge, a distance of 9 inches. Figure 24 shows the set up.

RESULTS.

At a load of 3,300 pounds the cap strips failed and the leading edge portion broke off at the rear side of the front spar. This tore the front spar from the rest of the wing structure.

Figure 29 shows the nature of the failure.

CONCLUSION.

The leading edge of the MB-6 wing is very satisfactory structurally since the factor of failure was 20.8, the required load factor for this test being 14.

TAIL SKID TEST.

DESCRIPTION.

The fuselage was attached at the front end to a steel column and a load of 234 pounds was placed on the rear of the fuselage over the tail skid. The rear end was so coupled to a hoist that it could be raised to the desired height and dropped.

PROCEDURE AND RESULTS.

The tail skid withstood the first drop which was through a distance of 6 inches. The failure occurred on the next drop which was through a distance of 12 inches. Figure 30 is a photograph of the failure.

DISCUSSION.

No deflection of the shock absorber elastic was noticed during the test.

CONCLUSION.

The tail skid is weak and poorly designed.

RECOMMENDATIONS.

Redesign tail skid and shock absorber to withstand drop test through distance of 36 inches.

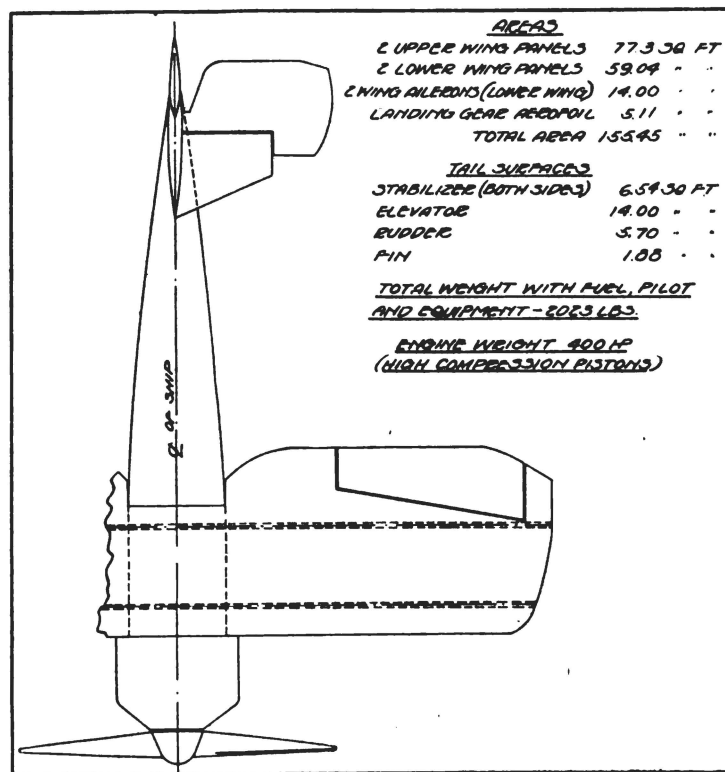


FIG. 1.—Plan view.

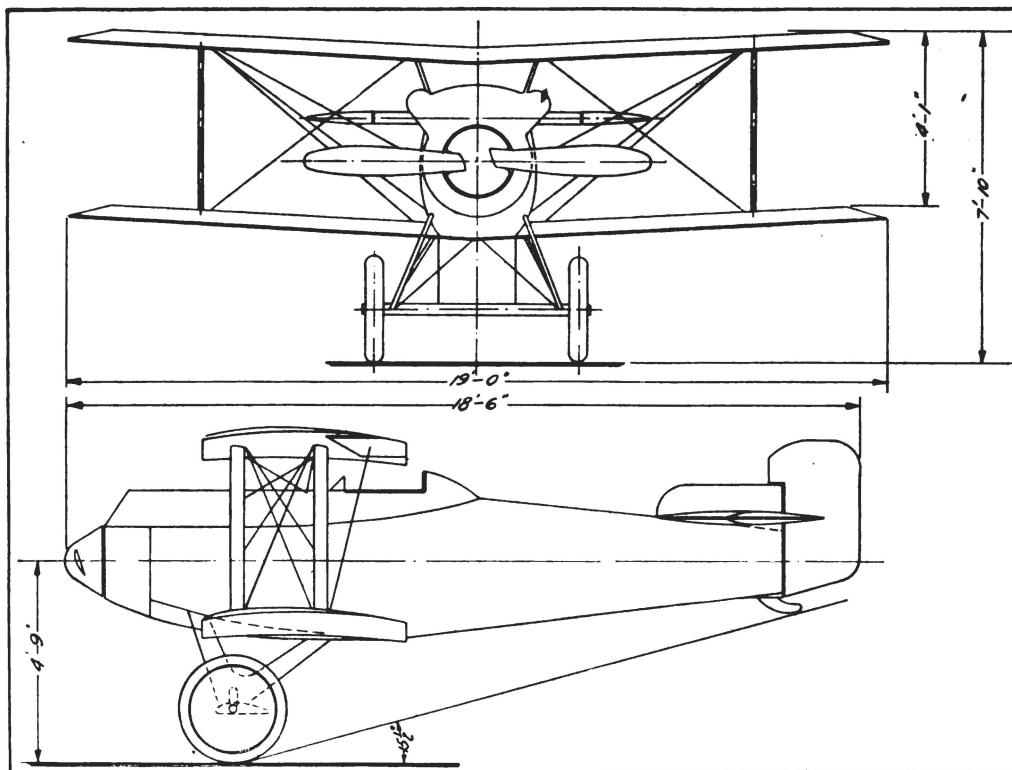


FIG. 2.—Front and side views.

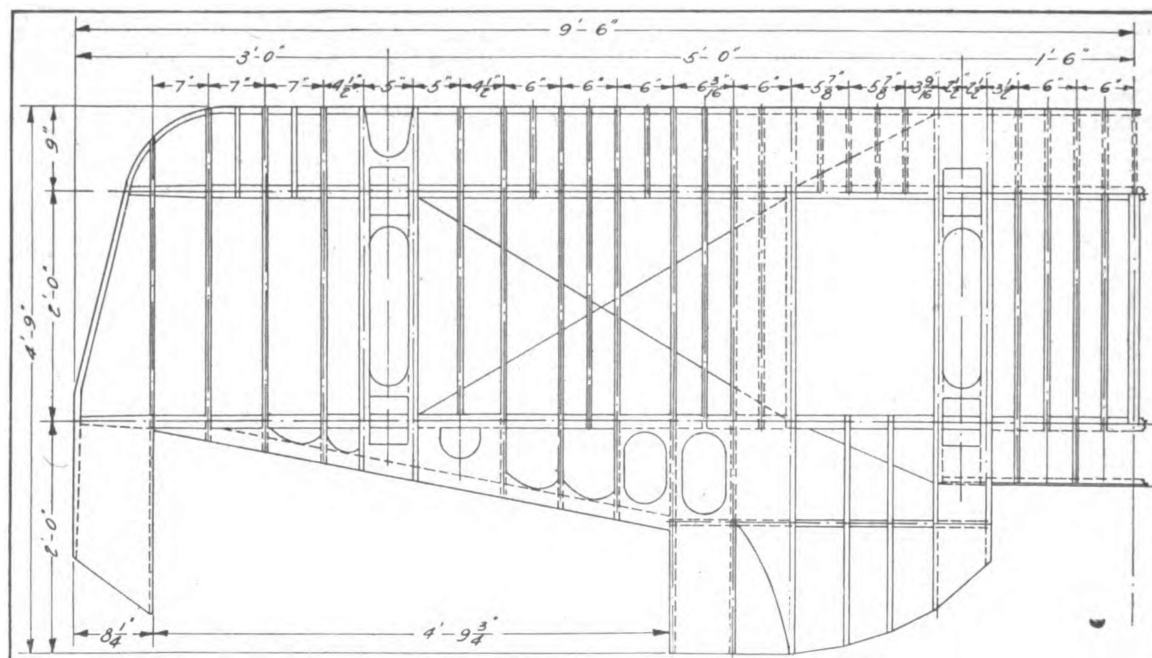


FIG. 3.—Upper wing structure.

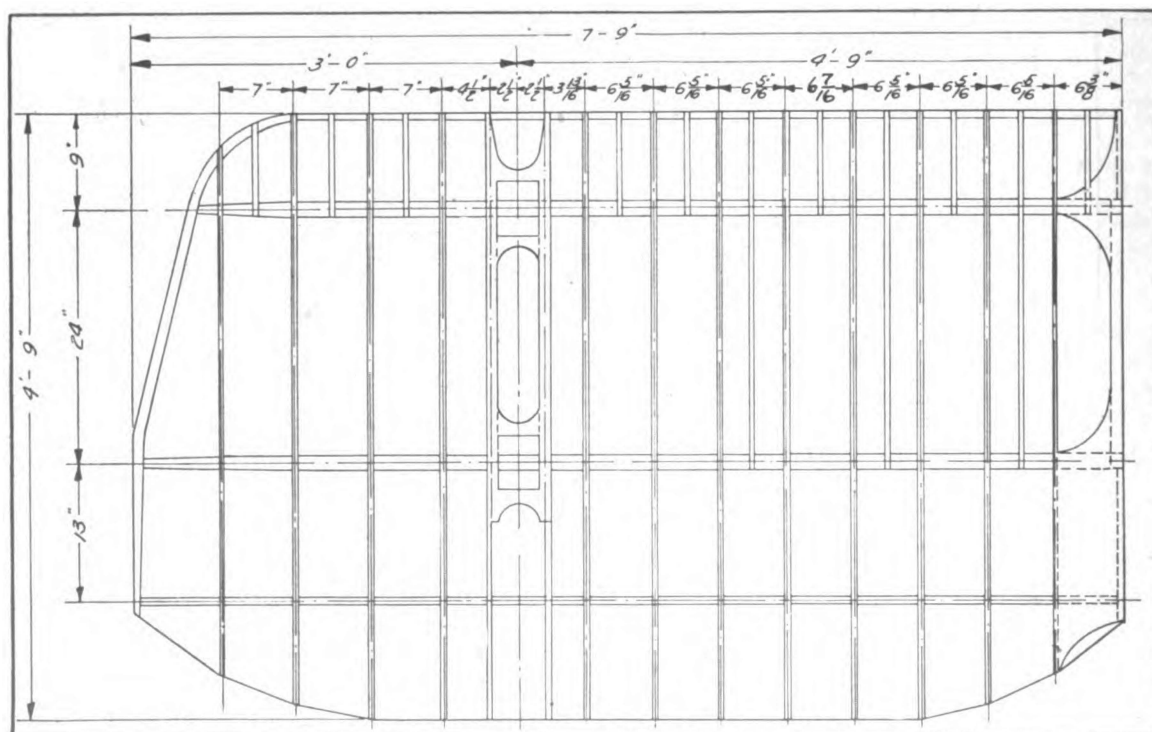


FIG. 4.—Lower wing structure.

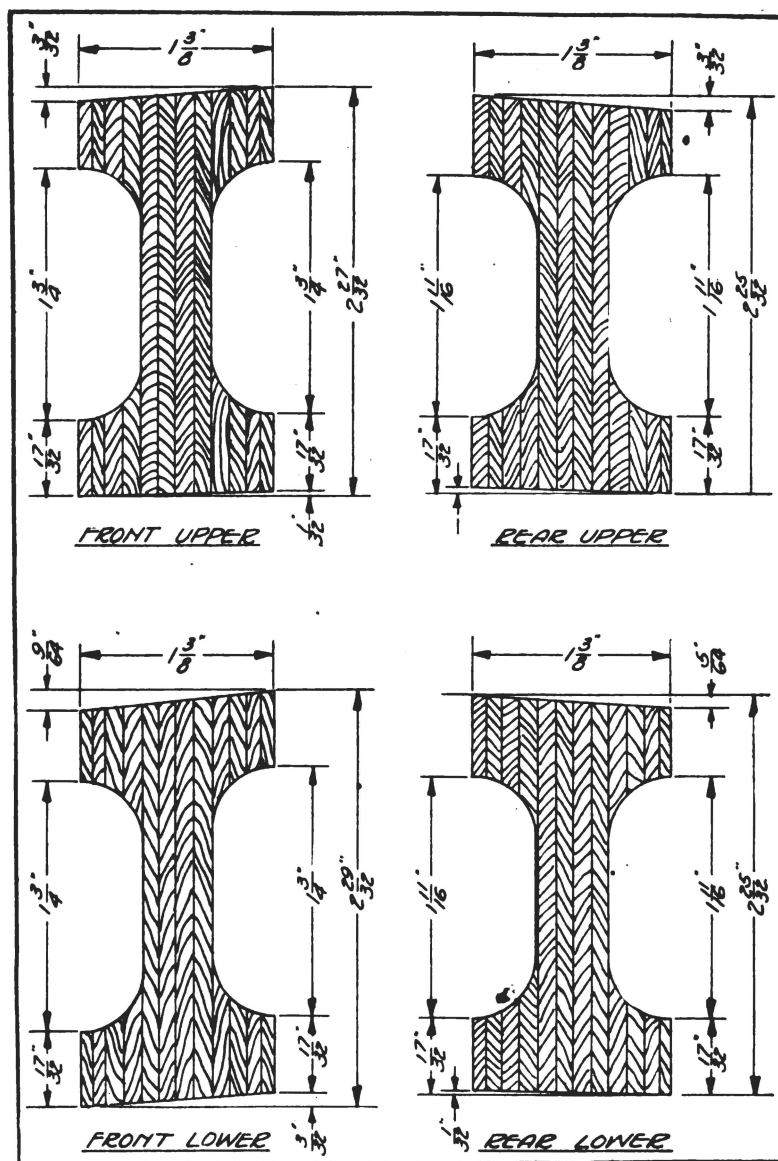
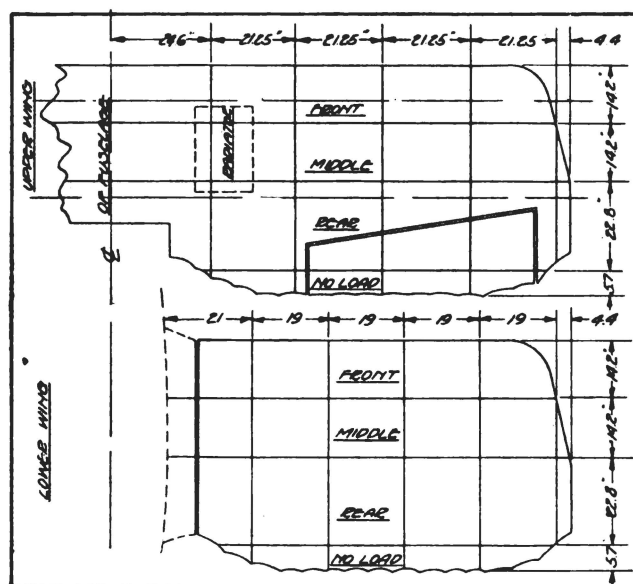


FIG. 5.—Typical spar sections.



LOW INCIDENCE WING LOADING SCHEDULE.

Load factor.	Loads on upper wing.				Loads on lower wing.			
	Front.	Middle.	Rear.	Total load.	Front.	Middle.	Rear.	Total load.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
2	580	580	580	1,740	520	530	520	1,570
3	800	880	890	2,670	800	810	800	2,430
4	1,200	1,200	1,200	3,600	1,080	1,080	1,080	3,250
4.5	1,360	1,360	1,360	4,080	1,220	1,230	1,220	3,660
5	1,520	1,520	1,520	4,560	1,360	1,370	1,360	4,090
5.5	1,680	1,680	1,680	5,040	1,500	1,510	1,500	4,510

FIG. 6.—Low incidence loading schedule.

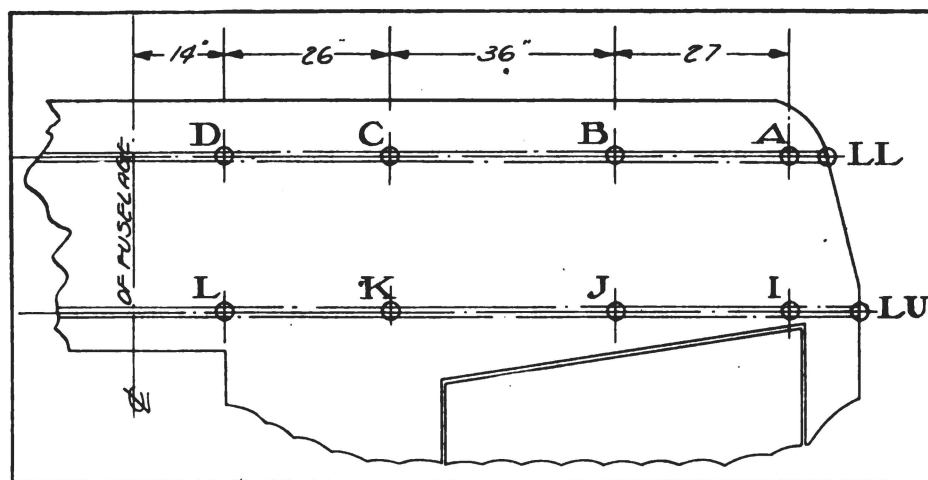


TABLE OF DEFLECTIONS FOR LOW INCIDENCE TEST.

Load factor.	Deflections in inches measured at points.																Retreat.			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	RL	RU	LL	LU
2	.6	.4	.2	.1	.2	.1	.0	.2	.6	.3	.4	.2	.1	.2	.1	.1	0	0	+.3	+.2
3	.7	.5	.3	.1	.2	.2	.1	.3	.8	.6	.5	.2	.2	.3	.2	.4	0	0	+.2	+.5
4	.9	.7	.3	.2	.3	.4	.3	.5	1.0	.6	.7	.3	.2	.3	.4	.6	0	0	+.2	+.5
4.5	1.1	.7	.3	.2	.3	.4	.3	.6	1.1	.8	.7	.4	.2	.4	.4	.8	0	0	+.2	+.5
5	1.3	.9	.5	.2	.3	.4	.3	.6	1.4	.9	.8	.4	.2	.5	.5	.9	0	+.1	+.2	+.5
5.5	1.5	.9	.5	.4	.4	.5	.4	.7	1.5	.9	.8	.5	.3	.5	.6	1.1	0	+.1	+.2	+.5

FIG. 7.—Deflection chart at low incidence.

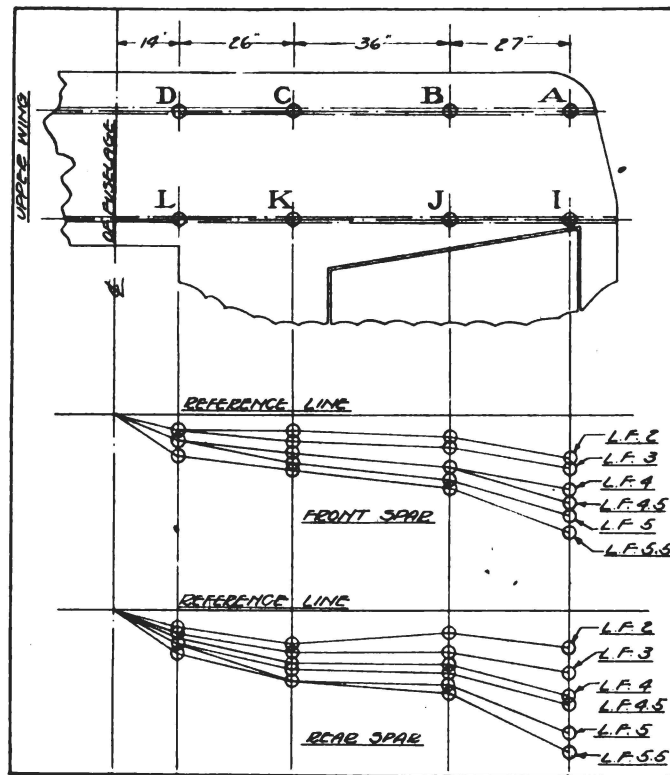
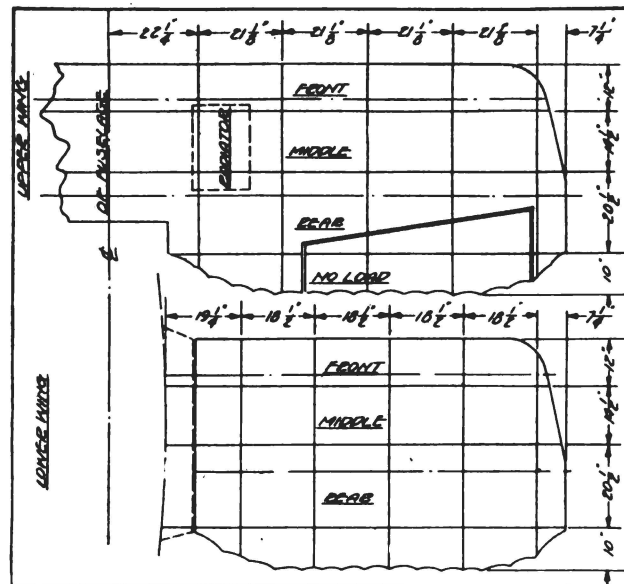


FIG. 8.—Spar deflection curves at low incidence.



HIGH INCIDENCE WING LOADING SCHEDULE.

Load factor.	Loads on upper wing.				Loads on lower wing.			
	Front.	Middle.	Rear.	Total load.	Front.	Middle.	Rear.	Total load.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
3	135	68	68	2,710	119	59	59	2,370
4	182	92	91	3,650	160	80	79	3,190
5	229	116	114	4,590	201	101	99	4,010
6	276	140	137	5,530	242	122	119	4,830
6.5	290	152	149	3,910	263	132	129	5,240
7	314	164	161	6,390	284	142	139	5,650
7.5	338	176	173	6,870	305	152	149	6,060
8	362	188	185	7,350	326	162	159	6,470
8.5	386	200	197	7,830	347	172	169	6,880
9	410	212	209	8,310	368	182	179	7,290

FIG. 9.—High incidence loading schedule.

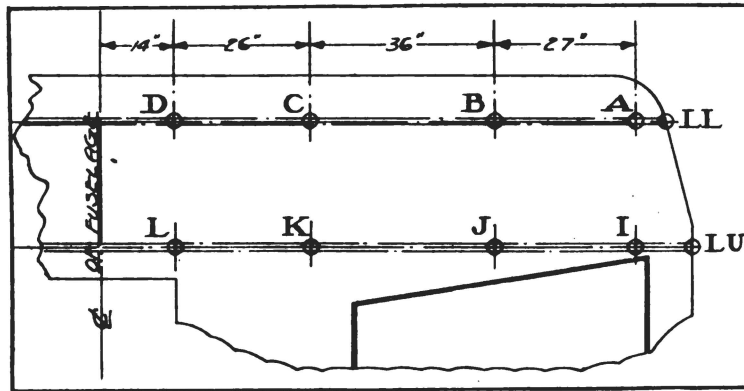


TABLE OF DEFLECTIONS FOR HIGH INCIDENCE TEST.

Load factor.	Deflections in inches measured at points.																Retreat.			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	RL	RU	LL	LU
3	.3	.1	.3	.0	.2	.3	.0	.2	.1	.1	.0	.0	.2	.2	.4	.6	+1	+2	-.3	-.1
4	.5	.2	.4	.1	.3	.5	.6	1.0	.2	.2	.2	.1	.2	.4	.6	.8	+1	+2	-.3	-.1
5	.7	.3	.5	.1	.4	.6	.8	1.2	.3	.3	.2	.1	.2	.4	.7	.9	0	+2	-.4	-.1
6	1.0	.5	.6	.3	.4	.7	.8	1.4	.6	.4	.4	.1	.4	.5	.8	1.1	-.1	+2	-.4	-.2
6.5	1.3	.6	.7	.3	.4	.7	.9	1.5	.7	.7	.4	.1	.4	.5	.8	1.1	-.1	+3	-.5	-.2
7	1.4	.7	.8	.3	.4	.7	1.0	1.5	.8	.6	.5	.1	.4	.5	.8	1.2	-.1	+3	-.5	-.2
7.5	1.5	.8	.9	.3	.4	.8	1.0	1.7	.9	.6	.5	.1	.4	.6	.8	1.2	-.1	+3	-.5	-.2
8	1.7	1.0	.9	.4	.4	.8	1.1	1.8	1.1	.6	.1	.4	.6	.9	1.4	1.4	-.1	+3	-.5	-.2
8.5	1.9	1.1	1.0	.4	.4	.9	1.2	1.9	1.3	.9	.6	.2	.4	.7	.9	1.4	-.1	+3	-.5	-.2
9																				

Failure.

Left rear strut fitting bolt sheared first. This caused left rear strut to fail.

FIG. 10.—Deflection chart at high incidence.

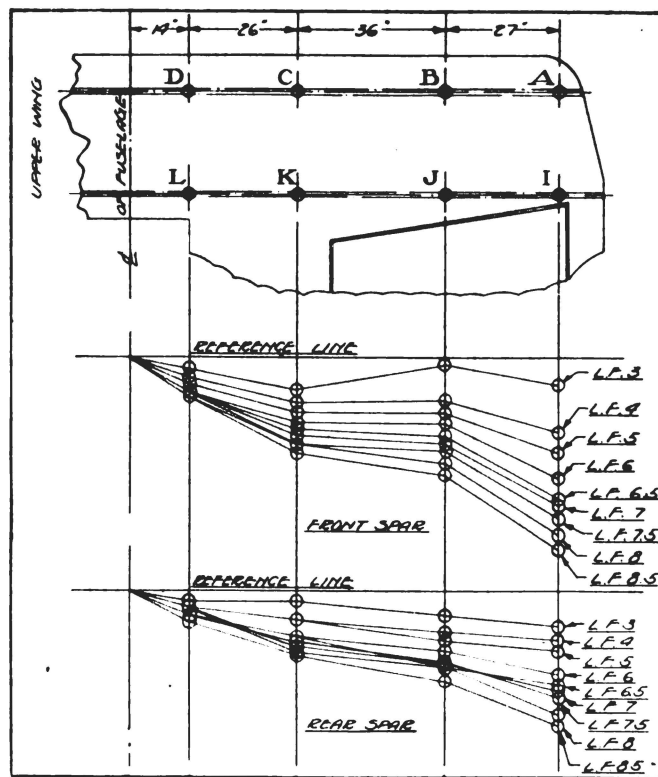
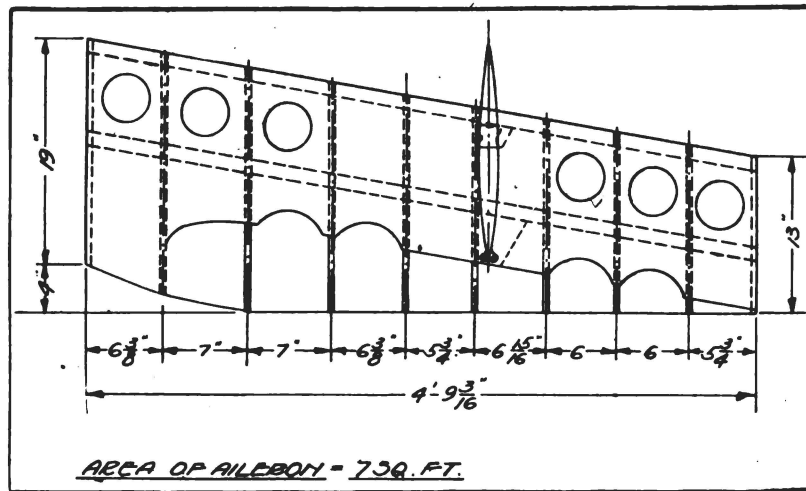


FIG. 11.—Spar deflection curves at high incidence.



AILERON LOADING SCHEDULE AND STRUCTURE.

Load in pounds, square feet.	Pull on stick.	Total load on aileron.	Remarks.
	<i>Pounds.</i>	<i>Pounds.</i>	
5	15	35	
10	20	70	
15	25	105	
20	35	140	
22.5	45	157.5	
25	55	175.0	
27.5	60	192.5	
30	65	210.0	
32.5	70	227.5	
35	80	245.0	
37.5	85	262.5	Held load without failure.

FIG. 12.—Aileron drawing and loading schedule.

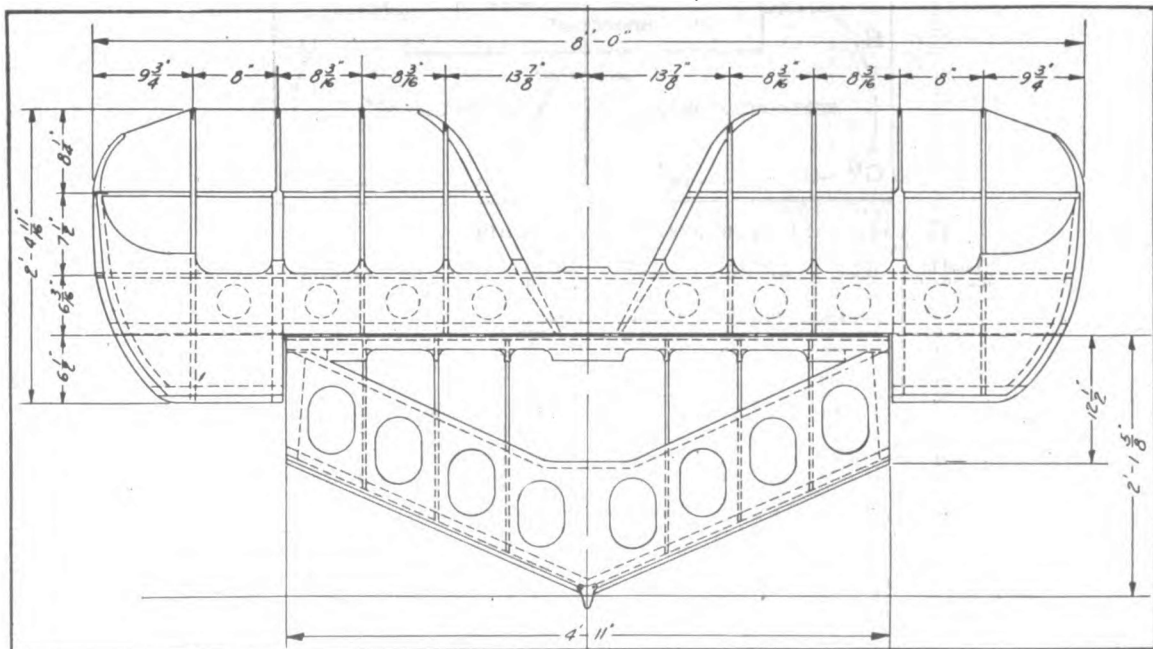


FIG. 13.—Stabilizer and elevator structure drawing.

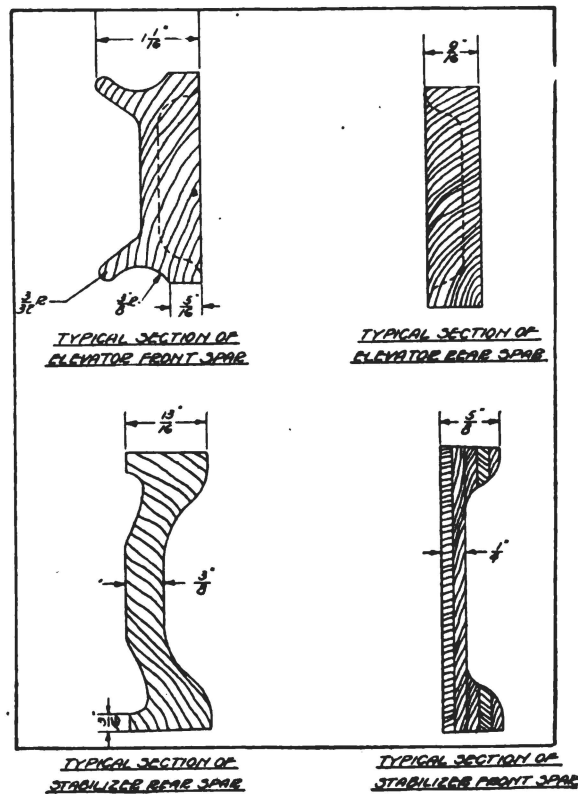
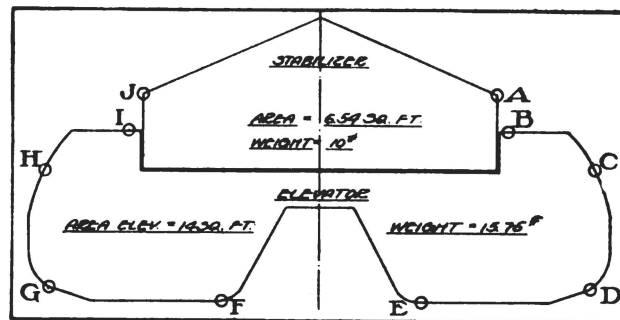


FIG. 14.—Typical sections of stabilizer and elevator.



ELEVATOR AND STABILIZER LOADING SCHEDULE AND TOTAL LOADS.

Load in lbs. sq. ft.	Elev.	Bal. Part.	Stab.	Total load on both.	Remarks.
	Pounds.	Pounds.	Pounds.	Pounds.	
5	52	8	40	100	
10	106	18	82	206	
15	158	26	122	306	
20	212	36	164	414	
22.5	238	40	184	462	
25	264	44	204	512	Stabilizer strut deflected $\frac{1}{8}$ inch.
27.5	290	48	224	562	Stabilizer strut deflected $\frac{1}{4}$ inch.
30	318	54	246	618	Stabilizer strut deflected $\frac{3}{8}$ inch.
32.5	344	58	266	668	Stabilizer strut deflected $\frac{1}{2}$ inch.
35	370	62	286	718	Stabilizer strut deflected $\frac{3}{4}$ inch.

Load in lbs. sq. in.	Pull on stick.	Deflections in inches measured at points.									
		A	B	C	D	E	F	G	H	I	J
5	15	.0	.0	-.1	.1	.0	-.1	.0	.1	.1	.1
10	30	.0	.2	-.0	.7	.6	.5	.6	.2	-.1	.1
15	45	.0	.4	.1	1.5	1.5	1.4	1.4	.3	-.3	.1
20	65	.0	.6	.2	2.4	2.2	2.2	2.2	.4	-.5	.1
22.5	75	.1	.8	.2	2.1	2.9	2.8	2.7	.4	-.7	.1
25	90	.1	.9	.2	3.3	3.1	3.0	3.0	.5	-.7	.1
27.5	100	.2	1.0	.2	4.1	3.9	3.8	3.7	.6	-.9	.1
30	110	.2	1.2	.3	4.6	4.5	4.3	4.2	.6	-1.1	.2
32.5	120	.3	1.4	.3	5.2	5.0	4.8	4.7	.6	-1.3	.2
35	130	.3	1.6	.3	7.2	7.0	7.0	9.6	.8	-1.9	.2

FIG. 15.—Loading schedule and results of test of horizontal tail surfaces.

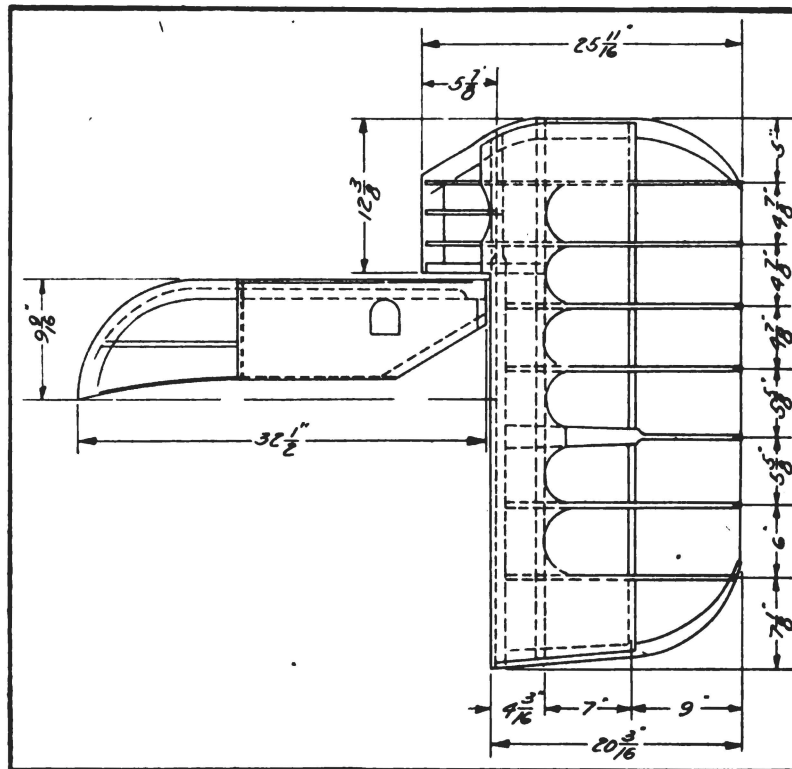


FIG. 16.—Rudder and fin.

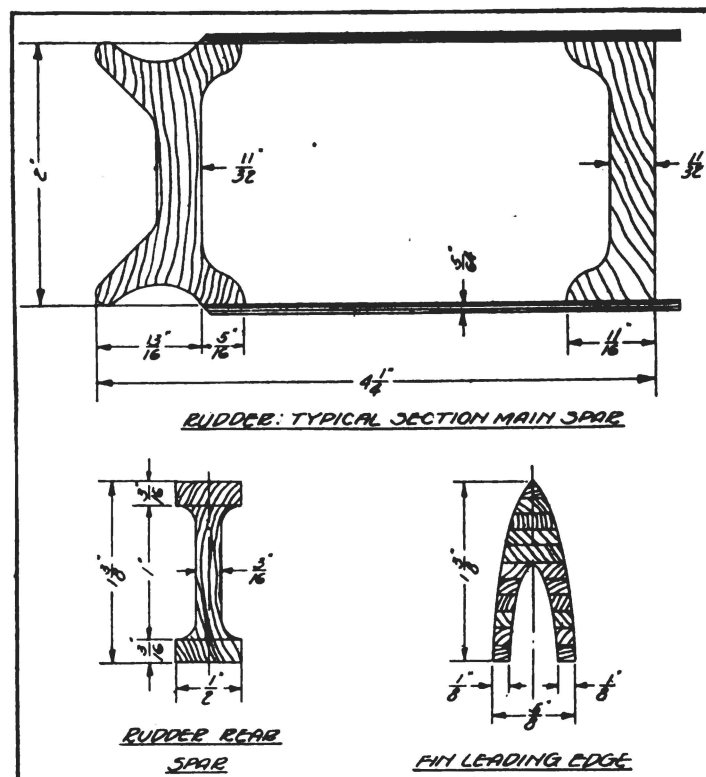
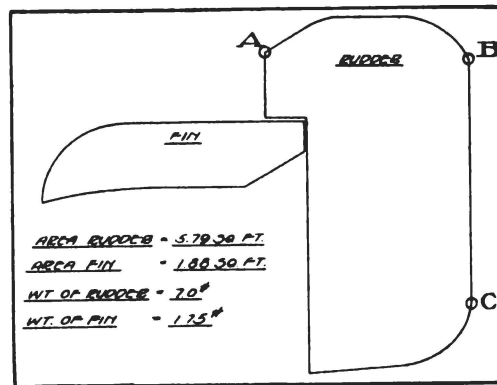


FIG. 17.—Typical sections of rudder and fin.



LOADING SCHEDULE AND RESULTS OF RUDDER AND FIN TEST.

Load factor.	Pull on stick.	Load on rudder.	Load on bal. part.	Load on fin.	Total load on surface.	Deflections in inches at points.			Remarks.
						A	B	C	
Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.				
5	35	24	2	12	38	+0.1	+0.1	-0.1	
10	70	48	4	24	76	.0	.0	+.6	
15	100	72	6	36	114	-.1	1.7	1.2	
20	140	96	8	48	152	-.1	2.0	1.4	
22.5	165	108	8	54	170	-.1	2.0	1.4	
25.0	185	120	10	60	190	-.3	3.0	2.2	
27.5	195	132	10	66	208	-.3	3.2	2.3	
30	210	144	12	72	228	-.4	3.7	2.6	
32.5	255	156	12	78	246				
35		168	14	84	266				
37.5		180	14	90	284				
40		192	16	96	304				Held.

Rudder control wires interfered with diagonal fuselage bracing wires.

FIG. 18.—Loading schedule and results of test of rudder and fin.

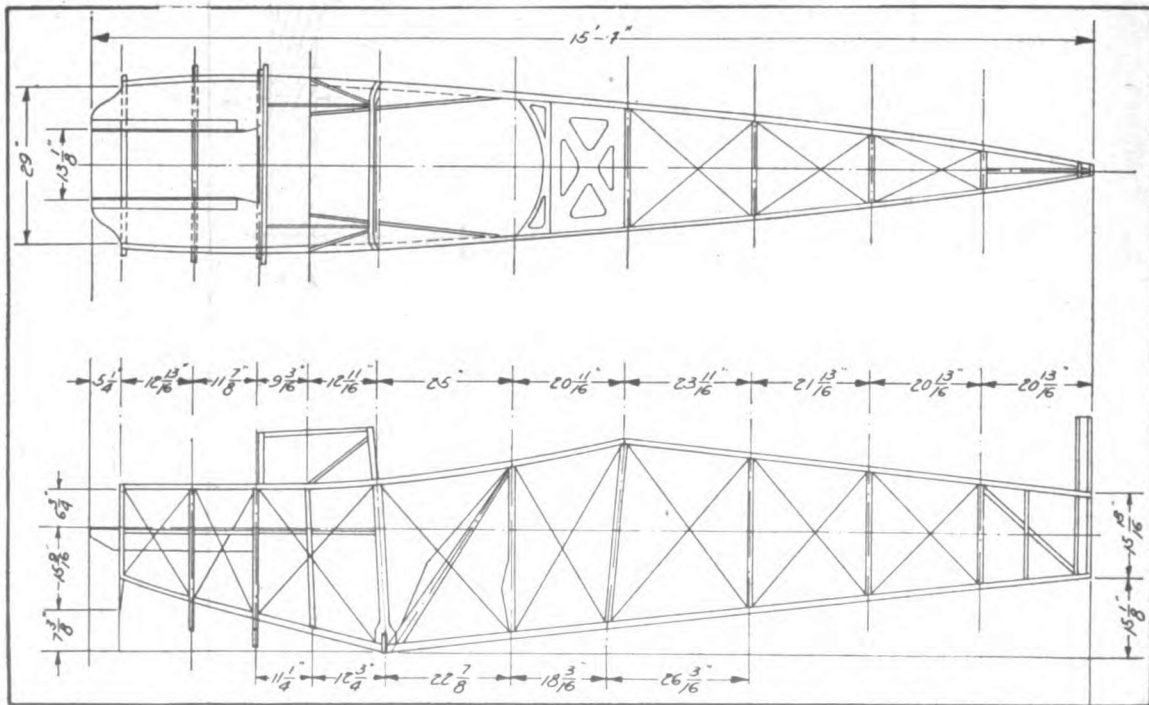
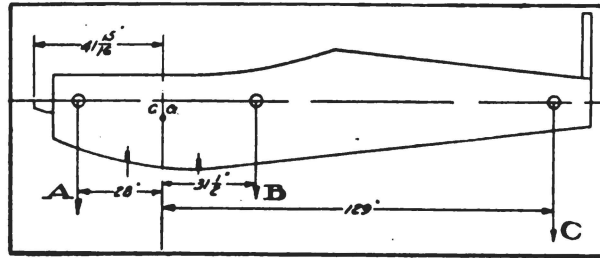


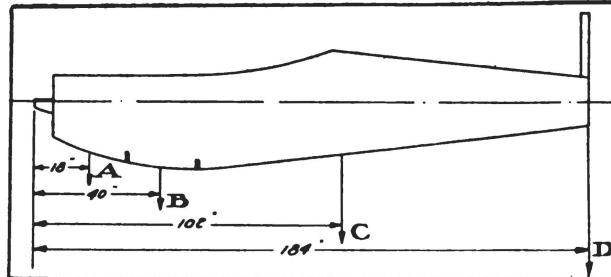
FIG. 19. Fuselage structure.



LOADING SCHEDULE FOR FUSELAGE TEST.

Load factor.	Loads, in pounds, at points—				Total load, in pounds, on structure.	Remarks.
	A	B	C	D		
2	2,000	564	510	329	3,403	
3	3,000	866	795	513	5,174	
4	4,000	1,168	1,080	697	6,945	
5	5,000	1,470	1,365	881	8,716	
5.5	5,500	1,621	1,508	973	9,602	
6	6,000	1,772	1,651	1,065	10,488	
6.5	6,500	1,923	1,794	1,157	11,374	
7	7,000	2,074	1,937	1,249	12,260	
7.5	7,500	2,225	2,080	1,341	13,146	
8	8,000	2,376	2,223	1,433	14,032	
8.5	8,500	2,527	2,366	1,525	14,918	
9	9,000	2,678	2,509	1,617	15,804	
9.5	9,500	2,829	2,652	1,709	16,690	
10	10,000	2,980	2,795	1,801	17,576	
10.5	10,500	3,131	2,938	1,893	18,462	
11	11,000	3,282	3,081	1,985	19,348	
11.5	11,500	3,433	3,224	2,077	20,234	

FIG. 20.—Loading schedule for fuselage.



DEFLECTIONS AND RESULTS OF FUSELAGE TEST.

Load factor.	Deflections, in inches, at—				Remarks.
	A	B	C	D	
2	0.6	0.4	0.1	-1.0	
3	.8	.8	.3	0	
4	1.0	.9	.3	0	
5	1.2	1.0	.4	-.1	
5.5	1.2	1.1	.4	-1.0	
6	1.2	1.2	.6	-.6	
6.5	1.2	1.2	.7	-.6	
7	1.3	1.3	.7	-.6	
7.5	1.4		.7	-.6	
8	1.4		.7	-.4	
8.5				-.3	
9				+.1	
9.5				.4	
10				.9	
10.5				1.5	
11				1.8	Held.
11.5					Failure of right and left brace wires in second bay forward from stern post.

FIG. 21.—Deflections and results of fuselage test.

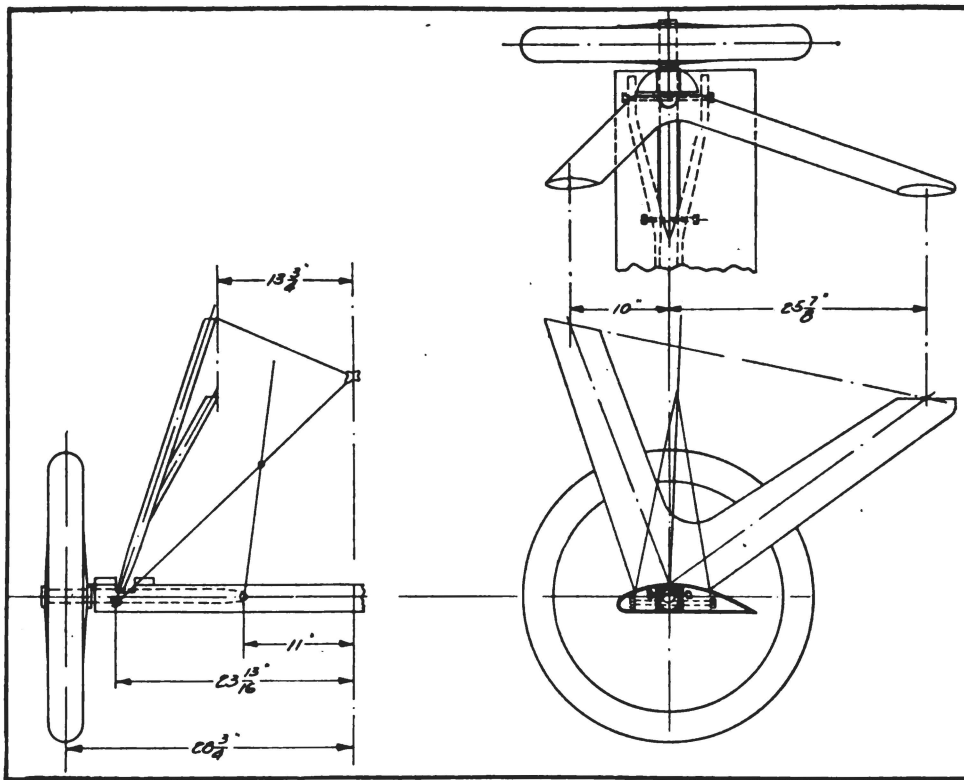
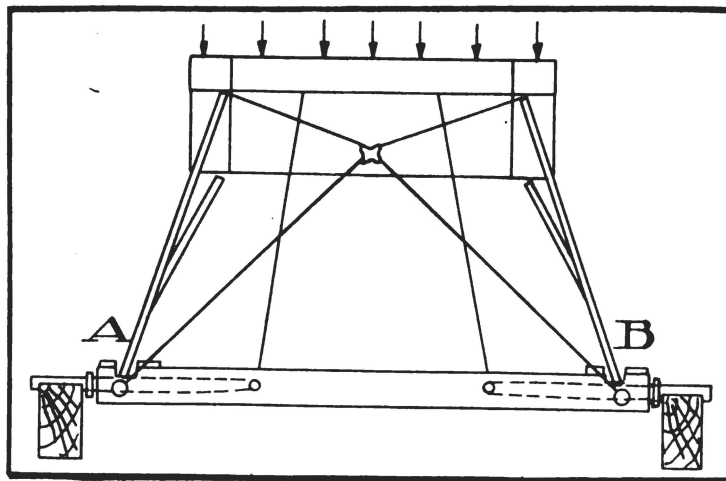
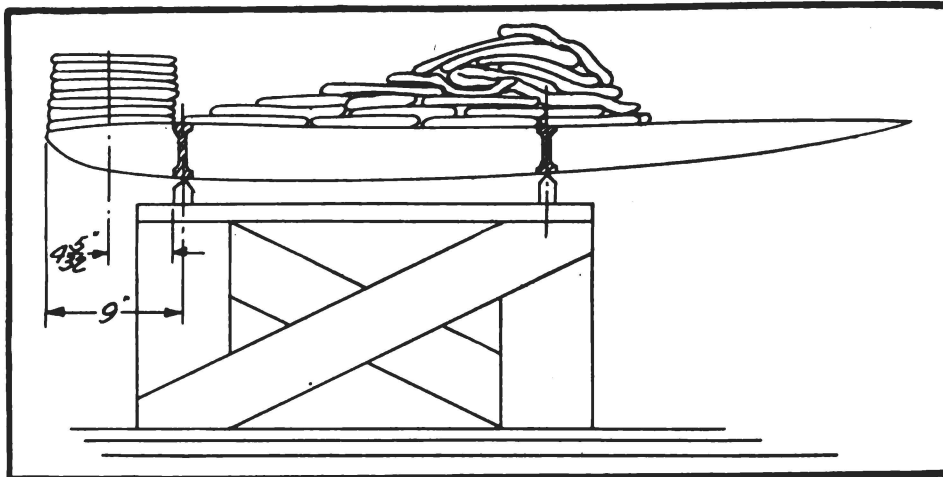


FIG. 22.—Landing chassis.

LOADING SCHEDULE—DEFLECTIONS AND RESULTS
OF LANDING CHASSIS TEST.

Load factor.	Deflections, inches, at—		Total load (pounds).	Remarks.
	A	B		
2	$\frac{1}{4}$	$\frac{1}{4}$	4,046	
3	$\frac{1}{4}$	$\frac{1}{4}$	6,069	
4	$\frac{1}{4}$	$\frac{1}{4}$	8,092	
4.5	$\frac{1}{4}$	$\frac{1}{4}$	9,103.5	
5	$\frac{1}{4}$	1.0	10,115.0	
5.5	$\frac{1}{4}$	$1\frac{1}{4}$	11,126.5	
6	$\frac{1}{4}$	$1\frac{1}{4}$	12,138.0	
6.5	$\frac{1}{4}$	$1\frac{1}{4}$	13,149.5	
7	$\frac{1}{4}$	$1\frac{1}{4}$	14,161.0	
7.5	$\frac{1}{4}$	$1\frac{1}{4}$	15,172.5	
8	$\frac{1}{4}$	$1\frac{1}{4}$	16,184.0	Failure of right front strut.

FIG. 23.—Loading schedule and results of test of landing chassis.



COMPUTATIONS AND DATA ON LEADING EDGE TEST.

Load on MB-6 wings for factor of 1 = 1,807 pounds.
 Load on upper wing for factor of 1 = $1,807 \times .52 = 939.64$ pounds.
 Span over which wing was loaded = 17.783 feet.
 Load on upper wing per foot run = $\frac{939.64}{17.783} = 52.83$ pounds.
 Load for factor of 1 on leading edge = $\frac{52.83}{2} = 26.465$ pounds.
 Load on leading edge causing failure = 3,300 pounds.
 $\frac{3,300}{6} = 550$ pounds = load per foot run causing failure.
 $\frac{550}{26.465} = 20.8$ = factor at which leading edge failed.

FIG. 24.—Leading edge test.

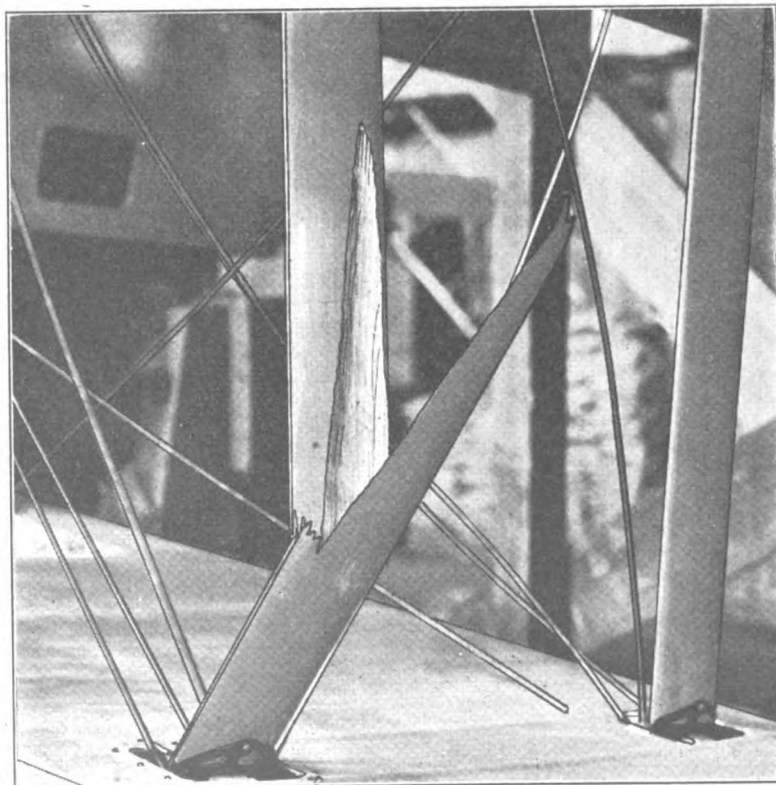


FIG. 25.—Strut failure.

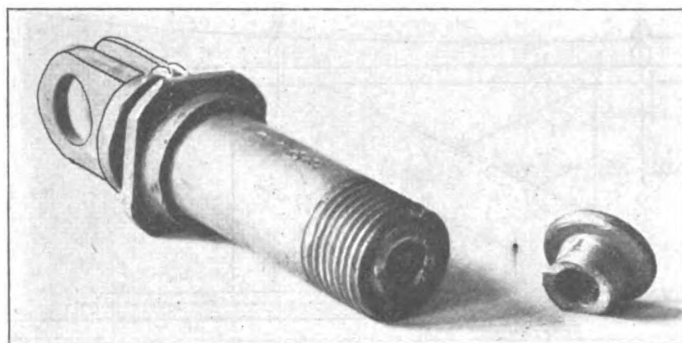


FIG. 26.—Strut fitting bolt.

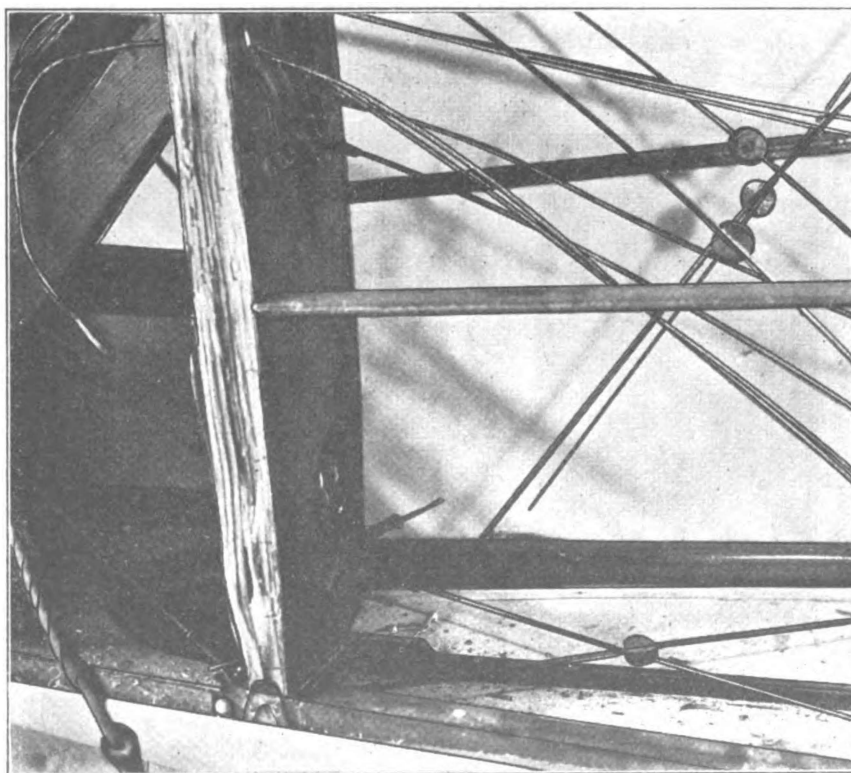


FIG. 27.—Fuselage failure.

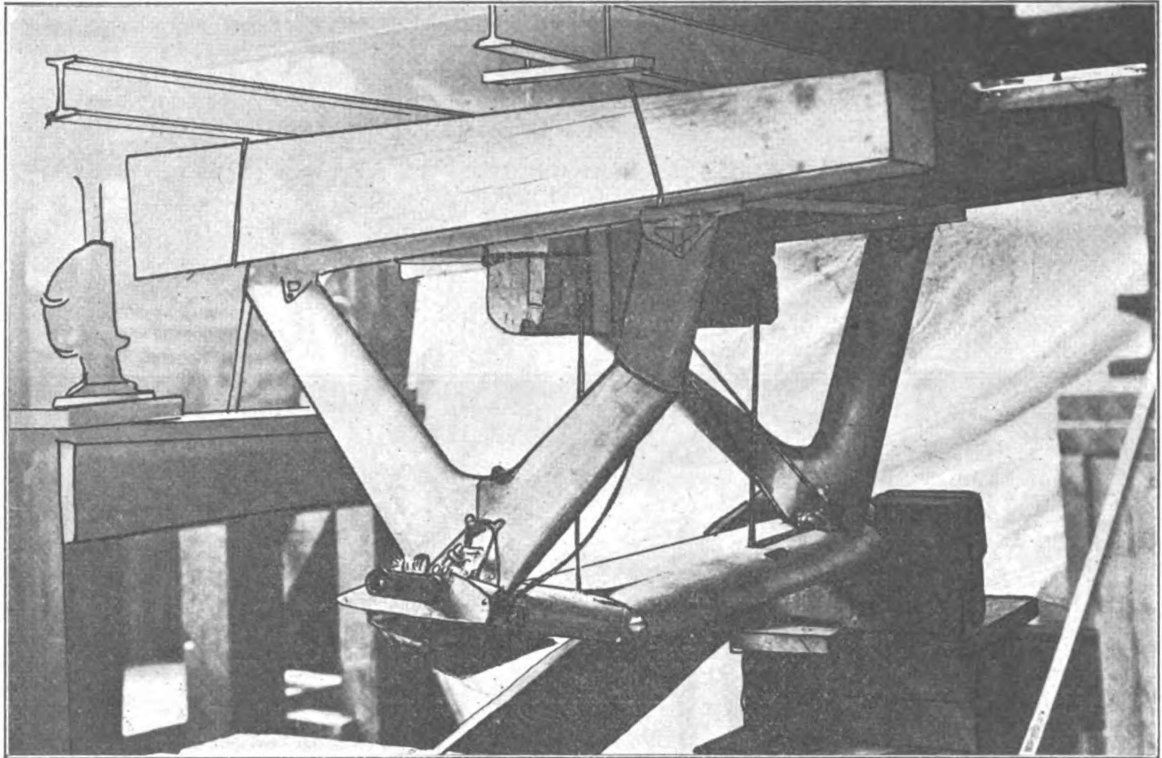


FIG. 28.—Landing chassis failure.

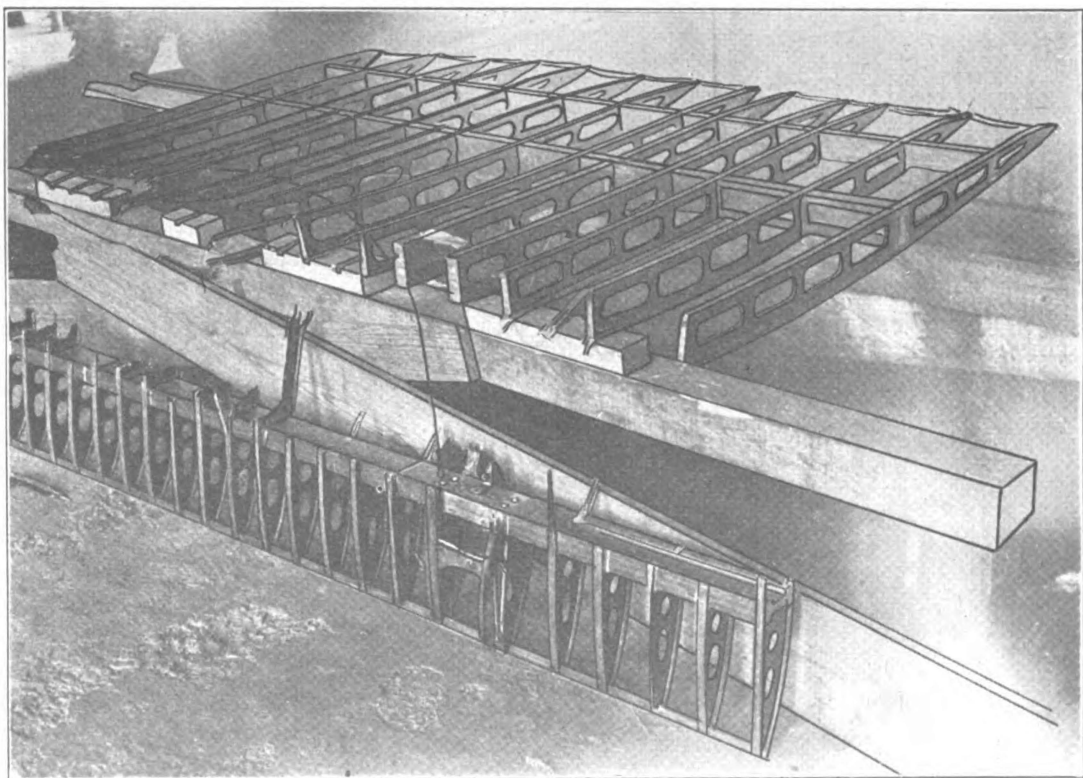


FIG. 29.—Leading edge failure.

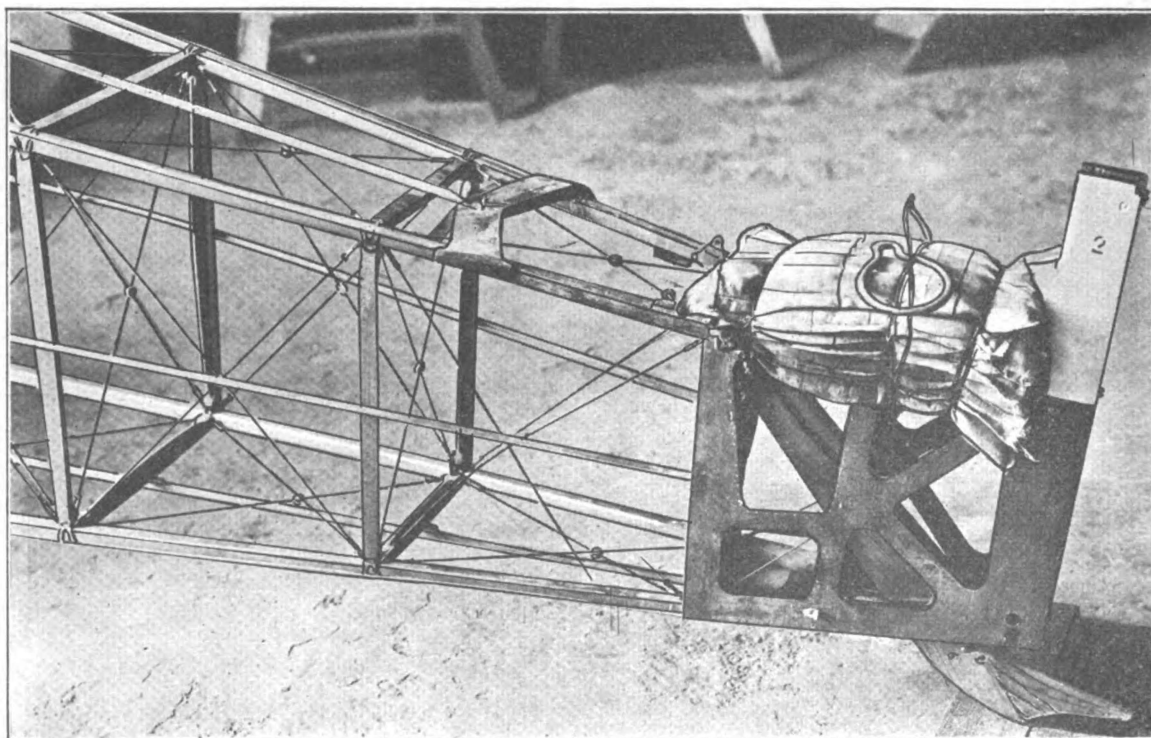


FIG. 30.—Tail skid failure.

○